Strengthening the Technological and Industrial Base for a Transformed National Security Environment

The Center for Strategic and International Studies' Defense-Industrial Initiatives Group

DUSD (Industrial Policy)
December 8, 2004

Agenda

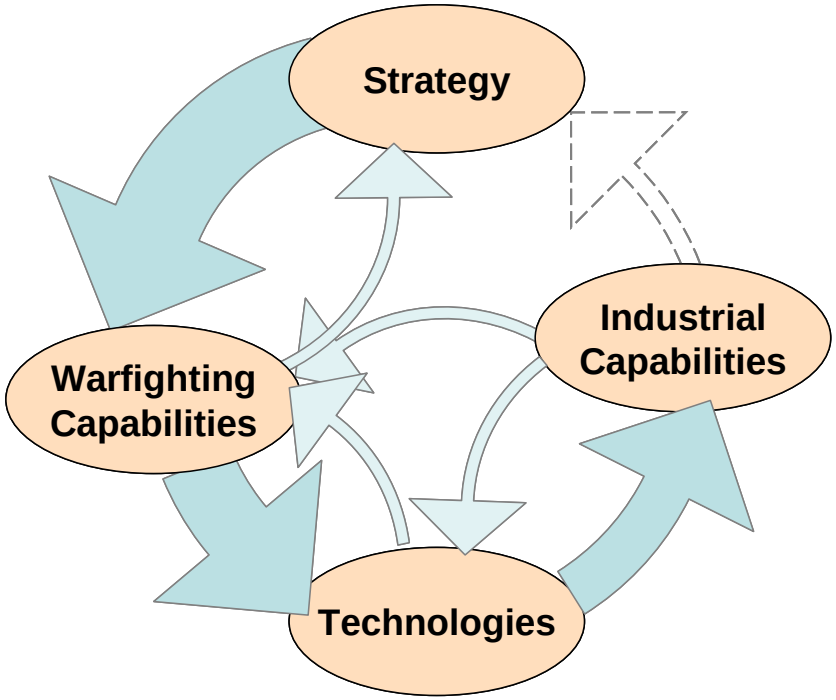
- Introduction: The Functional Capability Concept and its Role in Industrial Base Planning
- The Defense Industrial Base Capabilities Study (DIBCS) Methodology
- What Have We Learned?
- The DIBCS Series as a Strategic and Planning Tool

Introduction: The Functional Capability Concept and its Role in Industrial Base Planning

Value of the "Industrial Base Capabilities" Approach

- The approach enables the linking of defense strategy and vision to industrial policy

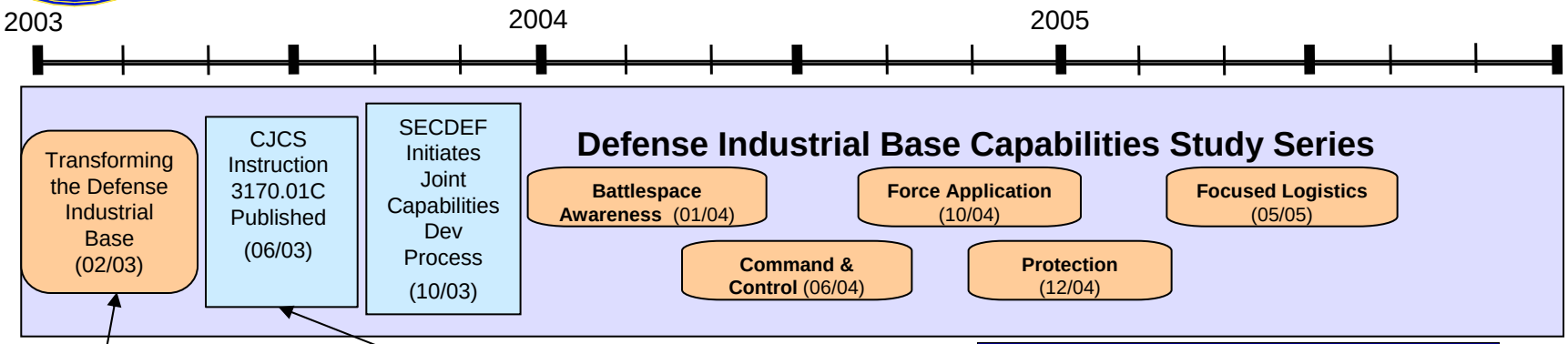
- Appropriately focuses industrial base assessments on the warfighting capabilities required—not vice versa



- Further benefits
  - Translates warfighting capabilities into associated technologies and industrial base capabilities, providing important investment guidance to the Department and industry
  - As end-to-end industrial base planning tool, can be adapted by other defense establishments for their own assessments/requirements

Source: Booz Allen Hamilton and ODUSD(IP)

The Defense Industrial Base Capabilities Study (DIBCS) Series



FINDINGS

- The Department should view industrial base as composed of operational effects-based sectors
- From program justification through budgeting and acquisition, the Department should organize its decision-making processes to optimize operational effects
- The Department should analyze the results of a systematic assessment of critical technology requirement in each of these sectors.

PURPOSE

- Established procedures to identify, assess, and prioritize joint military capability need
- Provided a construct for the Department's efforts to re-engineer corporate processes and unify focus on delivering warfighting capabilities
- Serves as the cornerstone in realigning the Department's planning and budgeting processes

DEFENSE INDUSTRIAL BASE CAPABILITY STUDY (DIBCS) SERIES STUDY OBJECTIVES

Develop a capabilities-based industrial framework and analytical methodology as a foundation for programmatic and investment decision-making.
Identify technology critical to enabling the new Joint Staff functional warfighter capabilities. Establish a reference database of these key critical industrial base capabilities mapped to warfighting functional capabilities.
Conduct industrial base capability assessments on priority critical technologies to identify deficiencies.
Develop a systematic method to craft industrial base strategies to remedy industrial base deficiencies identified and encourage proactive, innovative management of the industrial base.

Reports can be viewed and downloaded online at: http://www.acq.osd.mil/ip

Source: ODUSD(IP)

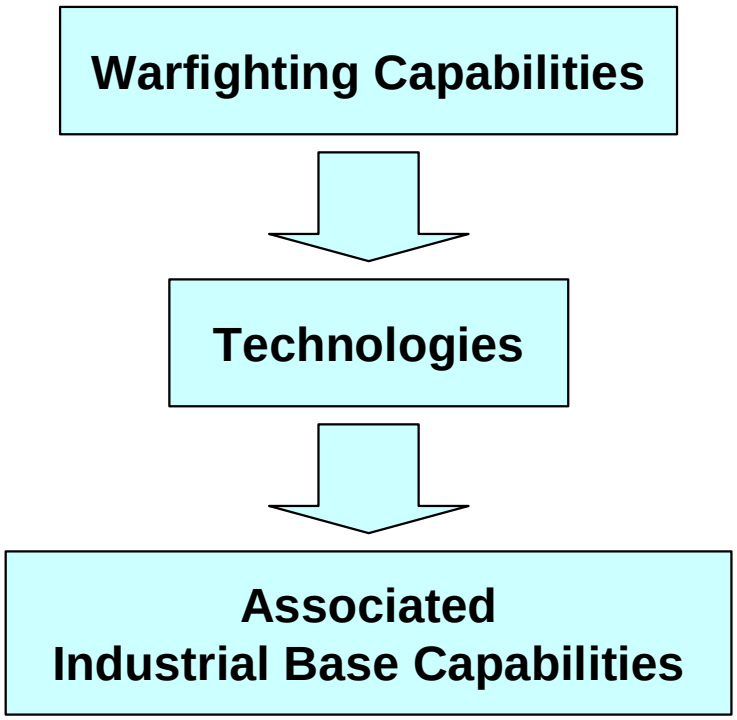
The Defense Industrial Base Capabilities Study (DIBCS) Methodology

Joint Staff Functional Concepts

Battlespace Awareness Global Hawk, DCGS, NPOESS, SBIRS-High, E-2 Advanced Hawkeye	Capabilities of commanders and force elements to understand their environment and the adversaries they face. Uses a variety of surveillance capabilities to gather information; a harmonized secure netcentric environment to manage this information; and a collection of capabilities to analyze, understand, and predict.
Command and Control FBCB2, AOC-WS, MPS	Capabilities that exercise authority and direction over forces to accomplish a mission. Involves planning, directing, coordinating, and controlling forces and operations. Provides the means to recognize what is needed and ensure that appropriate actions are taken.
Force Application JDAM, MM III, F/A-22, MH-60R, JSF, CVN21, FCS, GMLRS	Capabilities to engage adversaries with lethal and non-lethal methods across the entire spectrum of conflict. Includes all battlefield movement and dual-role offensive and defensive combat capabilities in land, sea, air, space, and information domains.
Protection ATIRCM/CMWS, PAC-3, Chem Demil	Capabilities that defend forces and U.S. territory from harm. Includes missile defense and infrastructure protection and other capabilities to thwart force application by an adversary.
Focused Logistics C-130, CH-47, GCSS, MPF, T-AKE, C-17, FMTV, MH-60S, C-5 RERP	Capabilities to deploy, redeploy, and sustain forces anywhere in or above the world for sustained, in-theater operations. Includes traditional mobility functions of airlift, sealift, and spacelift as well as short-haul (intra-theater and battlefield) transportation. Also includes logistics C2, training, equipping, feeding, supplying, maintaining and medical capabilities.

Source: Joint Staff Functional Concepts and ODUSD(IP)

DIBCS Methodology Overview



Description

Capabilities identified and prioritized according to leadership goals.
- Capabilities identified independent of platform or program solutions

Technologies identified for most important warfighting capabilities and prioritized

Industrial base capabilities assessed for the most important technologies

"This methodology is consistent with the operational ethos embodied in the U.S. defense industrial base: warfighting capabilities, and the warfighter as the primary constituent, must drive defense demand and the products the Department acquires."

Source: Booz Allen Hamilton and ODUSD(IP)

Defining Leadership Goals

Neutral	Position relative to potential adversaries is immaterial.
Equal	Desire capability at least as good as potential adversaries; systems are likely in a common technological generation.
Be Ahead	Desire a significant capability difference over potential adversaries; systems should likely lead by a technology generation or order of magnitude better performance in key attributes.
Be Way Ahead	Desire a very significant capability difference over potential adversaries; systems should likely lead by multiple technology generations or orders of magnitude in performance.

Source: Booz Allen Hamilton and ODUSD(IP)

DIBCS Methodology: Force Application Example

1

Identify U.S. Leadership Goals for Capabilities

DIBCS FA Comprehensive Capability Areas	Specific Capabilities by Leadership Goal			
	Neutral	Equal	Be Ahead	Be Way Ahead
Maneuver to Engage	0	33	39	25
Engagement Maneuvering	2	34	86	66
Engagement	5	175	267	304
1036 TOTAL	7	242	392	395

Decompose capabilities and identify functions to determine enabling technologies

2

Determine Enabling Technologies for Be Ahead/Be Way Ahead Capabilities

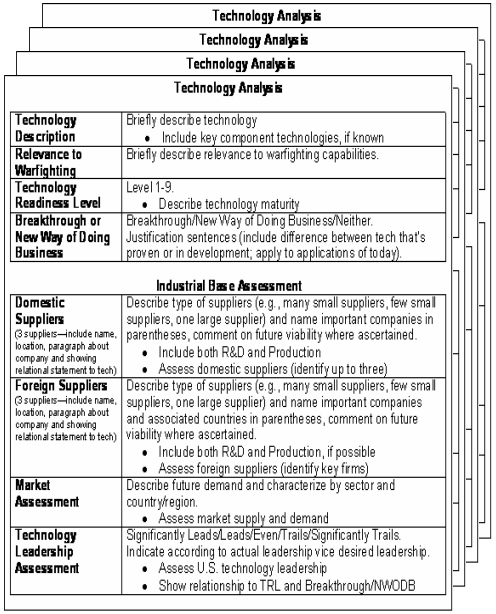
Critical Technology/ Industry List (212)

- Acoustic Energy Weapons
- Explosive Weapons
- Devices
- Guns/Cannons
- Kinetic Energy Weapons
- Optical Energy Weapons
- Propulsion
- RF Energy Weapons
- Special Purpose Weapons
- Structures
- Weapons Fuses
- Weapons Guidance and Control
- …

Prioritize technologies to focus and scope assessments

3

Assess Industrial Base Capabilities for Each Critical Technology



Priorities based upon:
- Type of capability enabled (*Be Ahead/Be Way Ahead*)
- Breakthrough or transformational nature of the technology
- Number capabilities enabled by technology (span of impact)

Source: Booz Allen Hamilton and ODUSD(IP)

For Want of a Nail …

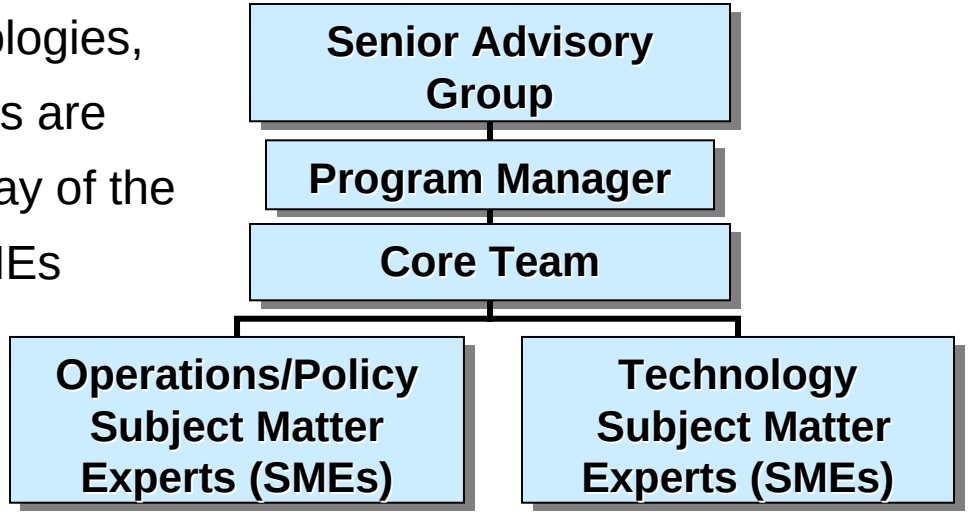
"For want of a nail, the shoe was lost; For want of the shoe, the horse was lost; For want of the horse, the rider was lost; For want of the rider, the battle was lost; For want of the battle, the kingdom was lost; And all for the want of a nail."

- DIBCS focuses on critical components, other components may cause failures
  - Supporting or structural components may not directly and exclusively enable warfighting capabilities
- Do not want to lose warfighting capability "for want of a nail…"
- However, cannot afford to assess every component
- Rely on the market for non-critical components but keep eyes open for problems
- DIBCS gives a framework for linking problems that arise to warfighting impacts
- Address remedies in same framework as critical component issues

Source: Benjamin Franklin, "Poor Richard's Almanack," June 1758

DIBCS Execution Team: Subject Matter Experts

- DIBCS is executed by a tailored team of experts
- Senior Advisory Group (SAG)—retired senior military and civilian DoD leaders and industry experts guide execution
- Program Manager and Core Team provide day-to-day execution foundation augmented by two types of subject matter experts (SMEs)
  - Operations/Policy SMEs identify and prioritize detailed warfighter capabilities and goals
  - Technology SMEs identify, prioritize, and evaluate technologies
- Capabilities, goals, technologies, and industrial assessments are refined through the interplay of the SAG, Core Team, and SMEs



Source: Booz Allen Hamilton and ODUSD(IP)

DIBCS Execution Team: Advisory Groups

Senior Advisory Group

Charter: Identify U.S. leadership goals for warfighting capabilities

Gen. (Ret) Thomas S. Moorman, Jr.
Vice Chief of Staff, USAF

VADM (Ret) Lyle G. Bien
Deputy Commander in Chief, USSPACECOM
Commander, Carrier Battle Group 7, embarked in USS Nimitz

Mr. Cosmo DiMaggio III
Industry Expert, Technology Research

LTG (Ret) Robert Noonan
Deputy Chief of Staff, Intelligence, Army

RADM (Ret) Robert M. Nutwell
Deputy Asst Secretary of Defense for C3I
Commander Abraham Lincoln Battle Group and Combined Task Force Fifty

Ms. Renata F. Price
Science Advisor, Deputy Chief of Staff, Research, Development and Acquisition, Army Materiel Command

Dr. Edward L. Warner
Asst Secretary of Defense for Strategy and Requirements
Asst Secretary of Defense for Strategy and Threat Reduction

Congressional and Industry Associations Red Team

Mr. William Greenwalt, Professional Staff Member, U.S. SASC
Mr. Jonathon Etherton, Vice President, Legislative Affairs, Aerospace Ind Assoc
Mr. Samuel Campagna, Director, Operations, National Defense Ind Assoc

Industry Red Team

Dr. Michael Andrews, Chief Technology Officer, L-3 Communications Holdings Inc.
Mr. Millard Firebaugh, Vice President-Innovation, Electric Boat
Mr. Evan Polley, Principal, Dragon Advisors

Business Process and Policy Implications Red Team

Mr. Andrew Marshall, Director, Office of Net Assessment, OSD
Dr. Anthony Tether, Director, DARPA
Dr. Robert Leheny, Deputy Director, DARPA

Functional Capability Red Team

Col. Gary Bender, Directorate for Intelligence, Joint Staff
Dr. Charles Holland, DUSD (Science & Technology)
Ms. Sue Payton, DUSD (Advanced Systems & Concepts)

Policy Implications Red Team

Mr. E.C. "Pete" Aldridge, former USD (Acquisition, Technology & Logistics)
Dr. Charles Holland, DUSD (Science & Technology)
Ms. Sue Payton, DUSD (Advanced Systems & Concepts)
Mr. Warren Citrin, former CEO, Solipsys
Mr. John O'Neill, President, Lockheed Martin Naval Electronics and Surveillance Systems—Undersea Systems

Advisory Groups provide an independent review, seasoned Department and industry perspectives, and immediate feedback on issues which result in a better product, more prepared for the audience.
Total estimated manhours per study: ~5,000. Associated contractor cost: $500-600K.

Source: Booz Allen Hamilton and ODUSD(IP)

DIBCS Methodology: Results for First Four Sectors

Methodology Execution

List of key (BA/BWA) Capabilities	Identify Technology Solutions and Create Technology List	Prioritize Tech List and Down-select Initial Priority Assessment List	Elaborate on Key Components	Assess Industrial Base for Techs and Components

Sector	Total # Cap.	Be Ahead	Be Way Ahead
BA	436	169	188
C2	255	146	43
FA	1,036	392	395
Prot	629	323	117
FL	TBD	TBD	TBD
Total	2,356	1,030	743

Sector	Number Techs
BA	278
C2	293
FA	212
Prot	277
FL	TBD
Total	1,060

Sector	Techs Assessed
BA	31
C2	35
FA	32
Prot	39
FL	TBD
Total	137

Sector	Components Assessed
BA	41
C2	23
FA	29
Prot	25
FL	TBD
Total	118

Sector	Techs Sufficient	Potential Issues
BA	69	3
C2	55	3
FA	53	6 + 2WL
Prot	55	7 + 2WL
FL	TBD	TBD
Total	232	19 + 4WL

Scope of DIBCS series systematically defines the most important technologies associated with 21st century *Be Ahead/Be Way Ahead* capabilities and is increasingly informing DoD processes and assessments.

Source: Booz Allen Hamilton and ODUSD(IP)

What Have We Learned?

What Have We Learned?

Examples of new insights into the industrial base via DIBCS:

- Importance of small and/or emerging suppliers (35-45% with less than 100 employees)
- Importance of protecting sufficient number of innovative sources for technologies still in R&D (e.g., swarming control tools)
- Importance of ensuring sufficient number of sources for widely-applied technologies (span of impact)
- Need for new Department processes
  - "Watch List"
  - Industrial Base Investment Fund (IBIF)
  - Evolving Capability Area Reviews (CARs)

Existing Tools to be Applied in New Ways

DoD		Interagency	
Measure	**Purpose**	**Measure**	**Purpose**
Fund S&T	Fund government and industry technology development to incorporate critical technologies in defense systems	Hart-Scott-Rodino Remedies	Maintain sufficient number of competitive sources
Stage competitions to add sources	Induce innovation. Major risk reduction for too few/failing source(s) or lack of performance	Exon-Florio Remedies	Maintain technology leadership and security of supply but allow foreign direct investment
Restructure Management Approach	Eliminate excessive self-dealing or narrow focus on specific issues or applications	Balanced Export Controls	Keep military technology from adversaries but allow competition in global markets
Block Teaming Agreement	Discourage fusion of innovation into single source; prevent cartel-like behavior	Foreign Cooperative Agreements	Help develop and access foreign sources where appropriate
Industrial Base Investment Fund	Fund producible multi-application innovation in programs of record		

In combination with effective program management and acquisition strategies, external measures such as HSR and CFIUS support and shape the industrial base available to the Department.

Source: ODUSD(IP)

The DIBCS Series as a Strategic Planning Tool

The Defense Industrial Base Capability Study Series as a Lexicon: From Warfighting to Technology and Industrial Base Capabilities

The Translation Process

Operational Capability Framework

- JFLFC Capabilities
- JPFC Capabilities
- JFAFC Capabilities
- JBAFC Capabilities
- JC2FC Capabilities

Joint Staff Inputs

Basic C2

- Monitor and Collect Data
- Develop a Situational Understanding
- Develop Courses of Action
- Develop a Plan
- Execute a Plan
- Monitor the Execution and Adapt

Collaborative C2

- Networking
- Interacting
- Sharing Information
- Sharing Awareness
- Sharing Understanding
- Deciding
- Synchronizing

IP Deliverables

- Broad Industrial Areas for Focused Logistics
- Broad Industrial Areas for Protection
- Broad Industrial Areas for Force Application
- Broad Industrial Areas for Battlespace Awareness
- Broad Industrial Areas for Command and Control

• Collaborative Management	• Displays
• Communication and Networking	• Location and Identification
• Computers	• Power Generation and Storage
• Data Management	• Software Encryption and Tasking
• Decision Support	• Unmanned Vehicle

=

137 Priority Critical Technologies Assessed[1]

19 Issues for BA, C2, FA, and Protection

IP Deliverables

- Issues in the Defense Sector of the FL
- Issues in the Defense Sector of the Protection
- Issues in the Defense Sector of the FA
- Issues in the Defense Sector of the BA
- Issues in the Defense Sector of the C2 Industrial Base

Technology	Industrial Base Sufficiency Analysis		
	Domestic Sources	Foreign Sources	
Helmet Mounted Display	5	4	
Swarming Control Tools	Many	Many	
Optical (Laser) Intersatellite Links	2	3	

IP Deliverables

- FL Technologies with Sufficient Industrial Base Capabilities
- Protection Technologies with Sufficient Industrial Base Capabilities
- 21 FA Technologies with Sufficient Industrial Base Capabilities
- 21 BA Technologies with Sufficient Industrial Base Capabilities
- 45 Command and Control Technologies with Sufficient Industrial Base Capabilities

1. Airborne Data Link
2. - Field Programmable Array
3. - Software Definable Transceiver
4. Bandwidth Accelerator
5. CAVE Automatic Virtual Environment
6. - Stereoscopic Eyewear
7. - Stereoscopic Projection
8. Collaborative Intelligence Fusion Tool
9. Collaborative Virtual Workspace
10. Course of Action Generation Software
11. Dynamic Database Fusion Tool
12. Encryption – Over-the-Air-Rekeying (OTAR) Device
13. Hardened Components
14. - Novel Shielding Materials
15. Helmet Mounted Displays – Head Tracking Display
16. Helmet Mounted Displays – Retinal Display
17. Laser Communications
18. Micro-Scale Fuel Cells
19. - Catalytic Micro-Combustors
20. - Micro-Reformers
21. Mini Mass-Storage Device
22. - Compact Holographic Memory
23. Miniaturized Low-Power Processors
24. Miniaturized Mass-Storage Device
25. - Nano-Electromechanical System (NEMs)
26. Multi-Hop-Band-Mode-Function Jam Resistant Radio
27. - Adaptive Transceiver
28. - Antenna
29. Nano-Composite Solar Cell
30. - Inorganic Semiconductor Nanorods
31. Next Generation Battery
32. - Nickel-Metal Hydride Battery
33. Next Generation Secure IFF
34. - Laser Interrogator
35. Satellite Control – Autonomous Satellite Control Software
36. – Cluster/Constellation Control
37. Software Programmable Radios
38. - Adaptive Computing System-on-Chip
39. Super Computer Processor
40. Tasking – Automated Sensor Cross-Cueing Tool
41. Tasking – Automated Sensor Cueing Tool
42. UV Control – Autonomous Vehicle Control Software
43. UV Speech Computer Control Tool
44. Wearable Computer
45. Wireless Network – Ultra Wideband Device

Source: Booz Allen Hamilton and ODUSD(IP)

[1] Out of a total of 1,060 technologies for BA, C2, FA, and Protection

Crafting Defense Business Strategies by Functional Capability

Actor	Objective	Process
Corporations, the Defense Industrial Base, Defense Establishments, and Supranational Organizations	Develop business strategies based on consolidated view of existing capabilities relative to required capabilities.	• Assess industrial capabilities using warfighting capability and critical technologies framework for reference • Assess technological/industrial base sufficiency for required warfighting capabilities • Leverages work done in DIBCS series as basis for specific assessments • Harmonizes industrial base vernacular to benefit capability planning and industrial base access

Source: ODUSD(IP)

Appendix A & B - DIBCS Command & Control Capability Framework and Critical Technologies Organized by Broad Industrial Areas

Appendix A

DIBCS Command & Control Capability Framework

Monitor & Collect Data

An initial picture or impression developed by a commander of the operational environment by observing the situation and orchestrating the collection of different types of information from different sources.

Obtain Information on Adversary Forces and Assets Equal
- Provide tasking to gather relevant Intelligence Preparation of Battlespace (IPB) concerning adversary states/actors/inhabitants of an area

Obtain Information on Adversary Forces and Assets Be Ahead
- Provide tasking to locate, identify, track, and observe adversary forces/actors anywhere (all domains)/anytime in near-real-time; to include assessment of size, deployment, and status
- Provide tasking for persistent surveillance of adversary leadership figures, facilities, proliferation mechanisms and high value forces in the face of adversary denial and deception efforts
- Provide tasking to gather data concerning adversary intent and methodology for carrying out the movement, deployment, and maintenance of forces
- Provide tasking to identify all classes of targets and their status
- Provide tasking for early warning of hostile actions

Obtain Information on Adversary Forces and Assets Be Way Ahead
- Provide shared control to synchronize cross-domain, cross-discipline collection efforts, execution of sensors, and exploitation of outputs
- Understand and detect potential adversaries' counter collection and denial (CC&D) against our monitor and collection capabilities
- Provide tasking to sense, identify, and track as necessary suspected CBRNE effluents, biomarkers, or facilities

Obtain Information on Non-Aligned Forces and Assets Equal
- Provide tasking to gather relevant intelligence preparation of the battlefield (IPB) data concerning the non-aligned states/actors/inhabitants of an area

Obtain Information on Non-Aligned Forces and Assets Be Ahead
- Provide tasking to locate, identify, track and observe non-aligned forces/actors anywhere (all domains)/anytime in near-real-time

Monitor & Collect Data – Continued

Obtain Information on Friendly Forces and Assets Be Ahead
- Provide tasking to blue forces (Joint and Combined) to report location and status of friendly forces/actors -- prompt and timely, in many cases on a near-continuous/real-time basis

Obtain Geospatial Information Equal
- Provide tasking to obtain precise mapping and geodesy information

Obtain Weather Information Be Ahead
- Provide tasking to provide continuous, highly accurate information on current and projected environmental conditions that will affect the ability of assigned forces to plan, execute, and support the plan

Obtain Logistics Information Neutral
- Task the engineering evaluation of structures to determine suitability for a particular use

Obtain Logistics Information Be Ahead
- Task, collect, fuse, and assess friendly unit/equipment/weapon systems status reports (SORTS/SITREPS)
- Obtain data from logistics C2 systems to include total asset visibility, management for assets being processed, moved or stored from supplier to consumer, and in-transit tracking of mobility operations (Note: Logistics C2 is part of the Focused Logistics sector)

Obtain Political and Military Information Equal
- Monitor and report world events and relevant government/public indicators/reactions relevant to the campaign

Appendix B

Critical Technologies for Command & Control Organized by Broad Industrial Areas

Communications and Networking

These technologies optimize communication channels in terms of their data throughput rates, capacity, security, and mobility. Bandwidth enhancers and bandwidth sharing tools expand the content and detail of the information being exchanged, as well as its update frequency. Wireless technology allows a channel to be established anywhere while robust security measures keep the data on that channel private.

3rd Generation Wireless Device (UWCC – 3G)	Digital Signal Processor
802.16-Compatible Device	Drive-by-Wire
Active Network Management Tool	Encrypted Switches
Adaptive Jitter Buffer	Extremely High Frequency (EHF) Transmitter/Receiver
Airborne Data Link	Frequency Hopping Equipment
Asset Preemption Tool	Global System for Mobile Communications (GSM) Phones
Automated Security Self-Evaluation Tool (ASSET)	Handheld, Portable Satellite Phone
Automatic Bandwidth Adjustment Tool	High Bandwidth Conduit
Automatic Fault Detection/Isolation/Correction Tool	High Bandwidth Router
Automatic Network Device Discovery and Configuration Tool	Infrared Wireless Communications Controller
Bandwidth Accelerator	Intersatellite Links
Bandwidth Compression Tool	Intraflight Data Link (IFDL)
Bandwidth Controller	Laser Communications (Lasercom)
Bandwidth on Demand Tool	Link Monitor Software
Beam Formation/Atmospheric Compensation Tool	Long-Wavelength Radio Transmitter/Receiver
Burst Communications Receiver/Transceiver	LPI/LPD Imagery Link
Channel Aggregation Tool	Microwave Link
Code Division Multiple Access (CDMA) Device	Monitoring Tool
Data Crosslink	Multiband Multiplexers

Data Management

In order to utilize the large volumes of data intrinsic to modern battlefield awareness, information must be securely saved and rapidly accessed. This requires hardware storage media to house the data and software to track, retrieve, and exploit the database information.

Activities Tracking Information Database	Machine Readable Cataloguing (MARC) Tool
Authentication Device	Massive Data Storage Device
Authorization Management and Advanced Access Control Models (AM&AACM)	Master Air Attack Plan (MAAP) Tool
Automated Data, Information & Information Request Tagging	Message Processing Tool
Compliance Management Software	Miniaturized Mass Storage Device
Consistent Data Playback Tool	Non-volatile RAM
Cryptographic Module Validation Program (CMVP)	Object Oriented Database
Data Conversion Tool	Optical Storage Device
Data Import/Export Tool	Parallel Data Processing/Data Reduction Software
Data Mining Software	Pattern Recognition Software
Data Synchronization Tool	Real-Time Data Handling/Storage Tool
Data Warehouse	Relational Database
Database Application Development Toolkit	Secure Database Replicator
Distributed Geospatial Meta Database	Secure Portable Data Storage Device
Document Tagging Tool	Social Software Analytics
Dynamic Database Fusion Tool	Spatial Indexing Software
High-Capacity On-board Satellite Data Storage	Temporal Indexing Software
High-Volume Imagery Database	Topicgraphical Indexing Software
Image Tagging Tool	Traffic Management Software
Intelligent Data Retrieval Tool	Web-enabled Timeline Analysis System (WebTAS)
Knowledge Management Software	

- Assess industrial capabilities by critical technologies using warfighting capability and critical technologies framework for reference
- Assess sufficiency

Appendix C – A Compendium of Representative Defense Technology Suppliers with Transformational Capabilities

Appendix C

A Compendium of Representative Defense Technology Suppliers with Transformational Capabilities

Technology Suppliers[1]					
Company Name	**Est.**	**Location**	**Employees**	**Sales (US$M)**	**Website**
Collaboration Management - Collaborative Intelligence Fusion Tool					
Alcatel (Alsthom Group)	1985	Paris, France	60,486	15,731.0	www.alcatel.com
ALPHATECH, Inc.	1979	Arlington, VA	200	40.0	www.alphatech.com
BTG's Defense Intelligence Business Group	-	Fairfax, VA	-	-	web.btg.com
General Dynamics Advanced Information Systems	1952	Arlington, VA	67,600	16,617.0	www.gd-ais.com
QinetiQ, Ltd.	2001	Hampshire, UK	9,000	1,399.1	www.qinetiq.com
Swedish Defense Research Agency's FOI Stockholm Information Fusion Group	1986	Stockholm, Sweden	1,300	136.0	www.foa.se
Collaboration Management - Collaborative Virtual Workspace					
CACI International, Inc.	1962	Arlington, VA	7,500	843.1	www.caci.com
Citrix Systems, Inc.	1989	Fort Lauderdale, FL	1,885	588.6	www.citrix.com
Collaborative Laboratories for Europe (CIBIT): De Utrecht; Aspen Enterprises, Ltd.; Learning Futures	1988	Netherlands, Brent Knoll, U.K., Abersychan, Wales	70	n.a.	www.cibit.com www.aspen.uk.com www.learningfutures.ndirect.uk
MatrixOne, Inc.	1983	Westford, MA	450	109.4	www.matrixone.com
metalayer AG	1999	Zurich-Kloten, Switzerland	32	-	www.metalayer.com
Silverline Technologies, Ltd.	1997	Warwick, UK	22	3.6	www.silverline.com
Communications and Networking - Bandwidth Accelerator					
AirZip	2000	Berkshire, U.K.	10	0.7	www.airzip.com
Expand	1998	Roseland, NJ	40	4.0	www.expand.com
Flashnetworks	1996	Amsterdam, The Netherlands	80	-	www.flashnetworks.com
InterWAVE Communications Int'l, Ltd.	1994	Menlo Park, CA	195	30.0	www.iwv.com
Venturi Wireless	1996	Sunnyvale, CA	39	-	www.venturiwireless.com
Communications and Networking - Data Link - Airborne Data Link					
BAE Systems	1977	Bristol, U.K.	68,400	14,911.2	www.baesystems.com
BES Systems, Ltd.	1998	Givataim, Israel	20	3.0	www.bes.co.il
General Dynamics United Kingdom, Ltd.	1952	Oakdale, South Wales, U.K.	67,600	16,617.0	www.generaldynamics.uk.com
Harris Corporation	1895	Melbourne, FL	10,200	2,092.7	www.harris.com

[1] Companies listed are representative; the list is not exhaustive. Inclusion or exclusion does not imply future business opportunities with or endorsement by DoD. Sources include: Hoover's, AMADEUS (Analyse MAjor Databases from EUropean Sources), open source internet research, and telephone polling.

Technology Suppliers[1]					
Company Name	**Est.**	**Location**	**Employees**	**Sales (US$M)**	**Website**
Communications and Networking - Data Link - Airborne Data Link (continued)					
L-3 Communications (Communications Systems - West Division)	1997	Salt Lake City, UT	38,700	5,061.6	www.l-3.com/csw
The Aero Telemetry Corporation	-	Huntington Beach, CA	-	-	www.aerotelemetry.com
Communications and Networking - Data Link - Airborne Data Link - Field Programmable Gate Array					
Altera Corporation	1983	San Jose, CA	2,000	827.2	www.altera.com
Atmel Corporation	1984	San Jose, CA	7,900	1,330.6	www.atmel.com
Faraday Technology Corporation	1993	Hsinchu, Taiwan	462	96.2	www.faraday-tech.com
Toshiba Design & Manufacturing Service Corporation	1965	Tokyo, Japan	165,776	47,191.8	www.toshiba.com
Xilinx	1984	San Jose, CA	2,612	1,397.8	www.xilinx.com
Communications and Networking - Data Link - Airborne Data Link - Software-Definable Transceiver					
Allamat Electonic, Ltd.	-	Dobris, Czech Republic	-	-	www.allamat.cz
AMI Semiconductor Belgium BVBA	1966	Oudenaarde, Belgium	2,569	454.2	www.amis.com
MicroStrain, Inc.	1986	Burlington, VT	20	3.0	www.microstrain.com
Motorola	1953	Phoenix, AZ	88,000	27,058.0	www.motorola.com
Rohde & Schwarz GmbH & Co KG	1933	Munich, Germany	5,885	992.6	www.rsd.de
Silicon Laboratories, Inc.	1996	Austin, TX	486	325.3	www.silabs.com
Communications and Networking - Data Link - Intraflight Data Link (IFDL)					
Northrop Grumman	1929	Los Angeles, CA	123,000	26,200.0	www.northgrum.com
Symetrics Industries, LLC	1962	Melbourne, FL	70	18.0	www.symetrics.com
Communications and Networking - Optical Communications - Intersatellite Links					
Ball Aerospace Technologies Corporation	1956	Broomfield, CO	2,505	491.2	www.ball.com
Matra Marconi Space[2]	1990	Germany	3,670	-	www.matra-marconi-space.com
Northrop Grumman	1929	Redondo Beach, CA	123,000	26,200.0	www.northgrum.com
Oerlikon-Contraves Group	1936	Zurich, Switzerland	7,435	1,919.5	www.oerlikoncontraves.com
SINTEF	1950	Trondheim., Norway	1,700	-	www.sintef.no

[1] Companies listed are representative; the list is not exhaustive. Inclusion or exclusion does not imply future business opportunities with or endorsement by DoD. Sources include: Hoover's, AMADEUS (Analyse MAjor Databases from EUropean Sources), open source internet research, and telephone polling.
[2] Matra Marconi Space merged with EADS in 2003.

For peer assessment, potential joint ventures, merger and acquisitions strategies

International Suppliers & DIBCS

- Take advantage of most innovative, efficient, and competitive suppliers—worldwide
- Consistent and fair dealings with allies and trading partners
- Assure domestic industrial base sufficient to meet most **critical defense** needs
  - Prefer domestic sources for technologies supporting warfighting capabilities with *Be Ahead/Be Way Ahead* leadership goals
- Use non-domestic suppliers to support critical warfighting goals when necessary and appropriate and when supplier and nation in which it resides have demonstrated reliability
  - Strategic Alignment: Responds to technology and product development requirements
  - Security of Supply: Meets delivery during peacetime and/or periods of conflict or tension
  - Technical Security: Precludes unauthorized transfer of information, technology and products within nation or to third parties